

GLOSSARY

Aerosols Any of a range of particles in the air, including soot, dust, and sulfates, that can intercept solar energy, sometimes scattering it and sometimes absorbing and reradiating it. Under different circumstances, they can either warm or cool the ground beneath and the air around.

African Humid Period The period after the close of the last ice age and before about 5,500 years ago, characterized by wet conditions in Africa, notably in the Sahara.

Albedo A measure of the reflectivity of a surface.

Anthropocene A new term to describe the past two centuries or so, during which human activities are seen to have dominated some key planetary processes such as the carbon cycle.

Arctic Oscillation A climate oscillation that occurs on timescales from days to decades. Measured by differences in air pressure between polar and nonpolar areas, and manifested in changing wind patterns that alter temperature. Related to (and sometimes synonymous with) the North Atlantic Oscillation.

Biological pump The process by which living organisms in the ocean draw carbon dioxide out of the atmosphere as they grow, and then deposit carbon on the ocean floor following their death. Has the effect of moderating the accumulation of CO₂ in the atmosphere.

Biosphere That part of Earth's surface, atmosphere, and oceans that is inhabited by living things.

Carbon dioxide fertilization effect What happens when higher concentrations of carbon dioxide in the air "fertilize" the faster growth of plants or other organisms.

Carbon cycle The natural exchange of carbon between the atmosphere, oceans, and Earth's surface. Carbon may be dissolved in the oceans, absorbed within living organisms and soils, or float in the air as carbon dioxide.

Carbon sink Anything that absorbs carbon dioxide from the air. Anything that releases carbon dioxide is a carbon source.

Chimneys A term coined by Peter Wadhams for giant whirlpools in the far North Atlantic that take dense water to the seabed. The start of the ocean conveyor.

Climate model A normally computerized simulation of the workings of the atmosphere. Often used to predict the effect of future changes such as an accumulation of greenhouse gases.

El Niño A periodic switch in the ocean currents and winds in the equatorial Pacific Ocean. A major perturbation in the global climate system.

Feedback Any by-product of an event that has a subsequent effect on that event. A positive feedback amplifies the original event, while a negative feedback dampens it. Key climate feedbacks include ice, water vapor, and changes to the carbon cycle. See also ice-albedo feedback.

Fossil fuel A fuel made from fossilized carbon, the remains of ancient vegetation. Includes coal, oil, and natural gas.

Gaia The idea, developed by James Lovelock, that Earth and its living organisms act in consort, like a single organism, to regulate the environment of the planet, including atmospheric chemistry and temperature.

Global warming Synonym for the greenhouse effect and climate change.

Greenhouse gas Any one of several gases, including water vapor, carbon dioxide, and methane, that trap heat in the lower atmosphere.

Gulf Stream The tropical ocean current that keeps Europe warm, especially in winter. Part of the ocean conveyor, and may be turned off at times, such as during ice ages.

Holocene The geological era since the end of the last ice age. Sometimes regarded as recently succeeded by the Anthropocene.

Hydrological cycle The movement of water between the oceans, the atmosphere, and Earth's surface through processes such as evaporation, condensation, rainfall, and river flow.

Ice ages Periods of several tens of thousands of years when ice sheets spread across the Northern Hemisphere and the planet cools. Believed to be triggered by Milankovitch cycles and amplified by positive feedbacks. Recent ice ages have occurred roughly every 100,000 years. The last ended 10,000 years ago.

Ice-albedo feedback A positive feedback on air temperature caused by the presence or absence of highly reflective ice. Thus, during warming, ice melts and is replaced by a darker surface of ocean or land vegetation that absorbs more heat, amplifying the warming. The reverse happens when cooling causes ice to form.

Ice sheets The largest expanses of ice on the planet. There are currently three: Greenland, West Antarctica, and East Antarctica.

Interglacials Warm periods between ice ages.

Intergovernmental Panel on Climate Change (IPCC) A panel of scientists appointed by the UN through national science agencies to report on the causes of, impacts on, and solutions to global warming.

Isotope One of two or more atoms with the same atomic number but containing different numbers of neutrons. For example: oxygen-16 and oxygen-18. The ratio of the isotopes in the air or oceans can vary according to environmental conditions, but will be fixed when the isotopes are taken up by plants, or air bubbles are trapped in ice. Thus isotopic analysis of ocean sediments, ice cores, and other leftovers from the past can be a valuable way of reconstructing past temperatures and other conditions.

Kyoto Protocol The 1987 agreement on climate change, whose provisions include cuts in emissions by most industrialized nations during the first compliance period, from 2008 to 2012. The U.S. and Australia subsequently pulled out.

Little ice age The period from the fourteenth to the nineteenth century when parts of the Northern Hemisphere were cooler than today.

Medieval warm period The period from the ninth to the thirteenth century when parts of the Northern Hemisphere were notably warm.

Methane clathrates Crystalline lattices of ice that trap large volumes of methane. Usually found at low temperatures and high pressures beneath the ocean bed or in permafrost.

Milankovitch wobbles Various wobbles in the orbit of Earth that can influence climate over timescales of thousands of years. Believed to be the trigger for ice ages. Named after the Serbian mathematician Milutin Milankovitch, but originally investigated by the forgotten Scottish amateur scientist James Croll.

Nuclear winter The theory that in a nuclear war, there would be so many fires that smoke would blanket the planet, causing massive cooling.

Ocean conveyor Global ocean circulation in which dense surface water falls to the ocean floor in the Arctic and near Antarctica, travels the oceans, and resurfaces about a thousand years later in the warm Gulf Stream of the Atlantic. Prone to switching on and off, and perhaps a major determinant of global climate.

Ozone hole An extreme thinning of the ozone layer seen in recent decades. Found each spring over Antarctica, but potentially could occur over the Arctic, too. Caused when man-made “ozone-eating” chemicals accumulate in the ozone layer. The immediate trigger for ozone destruction is low temperatures and sunlight.

Ozone layer The ozone within the lower stratosphere, which protects Earth from harmful ultraviolet radiation from the sun.

Permafrost Permanently frozen soil and rock found in the tundra regions of Siberia, Canada, Antarctica, and some mountain regions. Can reach a depth of more than 1.2 miles.

Precession One of the Milankovitch wobbles that affects the axis of Earth’s rotation. Changes the season when Earth is closest to the sun. Implicated in some climate changes during the Holocene.

Rainforest Forest that depends on frequent rainfall, but also generates rain by recycling water into the atmosphere from its leaves.

Southern Hemisphere annular mode (SAM) The Antarctic equivalent of the Arctic Oscillation. Responsible for strong warming of the Antarctic Peninsula in recent decades.

Stratosphere A layer of the atmosphere starting about 6 to 9 miles up. Home of the ozone layer. Greenhouse effect causes it to cool, but it may act to amplify warming in the troposphere beneath.

Thermal expansion The warming and resulting expansion of water in the oceans. Along with the melting of land ice, it is causing a worldwide rise in sea levels.

Troposphere The lowest layer of the atmosphere, occupying the 6 to 9 miles beneath the stratosphere. The area within which our weather occurs. Greenhouse effect causes it to warm.

Ultraviolet radiation Solar radiation with wavelengths shorter than light but longer than X-rays. Harmful to living organisms, which are largely protected from it on Earth by the ozone layer.